

West Nile Virus (WNV) Surveillance in Los Angeles County

Background

- WNV infection may cause severe neurologic illnesses including: encephalitis, aseptic meningitis, and acute flaccid paralysis syndrome in humans. Less than one per-cent of infected individuals will develop severe illness. The most important risk factor is advanced age.
- Most infections are asymptomatic. In adults, one in five persons will present with febrile, flu-like symptoms.
- Diagnostic testing is available through the Los Angeles County Public Health Laboratory (LACPHL) and confirmatory testing is done at the state Department of Health Services (DHS) Viral and Rickettsial Disease Laboratory (VRDL).

I. Human Case Surveillance in Los Angeles County

Human case surveillance is conducted by the LAC DHS Acute Communicable Disease Control (ACDC) Program. Currently, all cases of meningitis and encephalitis are reportable conditions in Los Angeles County within one working day. ACDC is notified of each case report through the Morbidity Central Reporting Unit. An ACDC physician or nurse epidemiologist reviews all cases of encephalitis and meningitis. Single arboviral infections are investigated as well as outbreaks of aseptic meningitis and encephalitis. Statistical analysis is completed quarterly.

How to report suspected cases of West Nile Virus infection or other reportable communicable disease conditions: Suspected WNV cases and other reportable diseases may be reported by telephone to the Morbidity Central Reporting Unit (MCRU) at 888-397-3993, or faxed to 888-397-3778 using a Confidential Morbidity Report <http://lapublichealth.org/acd/reports/Reporting%20Forms/CMR.pdf>. To consult with an ACDC physician during business hours, call (213) 240-7941 or fax (213) 482-4856.

ACDC Program roles include:

- Maintaining surveillance data on all cases of encephalitis and aseptic meningitis.
- Analysis of human surveillance data and directing outbreak investigations as needed.
- Epidemiologic investigation of all reported WNV serologically positive cases and completion of WNV case report forms on all WNV suspected cases.
- Working conjointly with independent vector control districts, LAC DHS Environmental Health, LAC DHS Veterinary Public Health, the Public Health Laboratory and other entities (e.g. blood banks, State of California DHS, and Centers for Disease Control and Prevention) to ensure appropriate WNV surveillance and prevention activities.
- Keeping the public and medical community informed of surveillance and prevention activities related to West Nile Virus and other arboviruses.
- Providing diagnostic services and consultation to medical providers.

II. Role of the Public Health Laboratory

- Laboratory surveillance for human WNV infection.
- Confirmatory testing of positive WNV human specimens from commercial laboratories.
- Referral of positive WNV specimens for confirmatory testing at the California DHS Viral and Rickettsial Disease Laboratory (VRDL).

A. Testing Methodology

- **IgM ELISA Screening test** for WNV only (FDA approved 1 day test): Serum and cerebrospinal fluid (CSF).
- **IgM Capture and IgG Enzyme Immunoabsorbent Assay (EIA):** This is the testing method of choice for the CDC and most experts in the field of arboviral surveillance. These tests can be performed on serum and CSF. Every specimen submitted will be screened for WNV and Saint Louis Encephalitis (SLE) IgM and IgG antibodies concurrently. For all neurological cases, both serum and CSF are required.
- **Polymerase Chain Reaction (PCR):** PCR can be done on CSF or tissue. This test will be performed only by special request since it has very low sensitivity (10%) and is not considered an appropriate surveillance test for WNV.
- **Immunofluorescent Antibody (IFA):** This method is available to test for WNV antigen in serum and CSF specimens.

WNV and arboviral serologic tests are run weekly without charge upon approval by ACDC and submission of a completed case history form. The laboratory test turn-around-time is between 24 to 72 hours, depending on testing methodology. All positive tests are confirmed at the state VRDL.

B. Criteria for WNV Human LAC Public Health Laboratory testing

- **Viral meningoencephalitis:** a clinical diagnosis characterized by:
 - 1) Fever $\geq 38^{\circ}\text{C}$ or 100°F , **and**
 - 2) CNS involvement, including altered mental status (altered level of consciousness, confusion, agitation, or lethargy) or other signs (cranial nerve palsies, paresis or paralysis, or convulsions) **and**
 - 3) An abnormal CSF profile suggesting a viral etiology (a negative bacterial stain and culture with pleocytosis [WBC between 5 and 1500 cells] and/or an elevated protein level [$\geq 40\text{mg}$])
- **Aseptic meningitis:** headache, an abnormal CSF profile suggestive of a viral etiology.

- **Acute flaccid paralysis syndrome** especially with atypical features, such as fever, limb paralysis, altered mental status, and/or a pleocytosis in the spinal fluid. This syndrome maybe appear clinically similar to Guillain-Barré syndrome.
- **West Nile Fever**: Febrile, flu-like illness, in individual with epidemiologic history compatible with WNV infection. Serologic testing by LAC public health laboratory will be run on a case-by-case basis after discussion with ACDC medical epidemiologist.

C. How to arrange testing: Due to limited laboratory capacity, testing for WNV infection at the Los Angeles County Department of Health Services is being prioritized for hospitalized patients or individuals evaluated in an emergency room with viral encephalitis, aseptic meningitis, or acute flaccid paralysis syndrome. When you call to report a suspected case, we will help determine whether testing is necessary, and, if so, help your laboratory arrange it.

D. Which specimens to obtain:

- CSF—1-2 cc of CSF without preservatives. Please instruct your laboratory to keep specimens frozen at -70°C .
- Serum—5-10 ml in a redtop tube. Sera should be refrigerated, spun, separated and not frozen.

A COMPLETED [CASE HISTORY FORM](#) MUST BE INCLUDED WITH CLINICAL SPECIMENS SUBMITTED FOR WEST NILE VIRAL TESTING. ALSO FAX THE CASE HISTORY FORM TO ACDC, 213-482-4856.

III. **Veterinary Surveillance for Equine West Nile Virus Infection**

- WNV may cause fatal encephalitis in horses, although the majority of infections are mild or asymptomatic. Horses are considered “accidental hosts” and therefore do no play any role in maintaining the virus in nature.
- A WNV vaccine is available for horses. This vaccine was fully licensed in February 2003. Horse owners should discuss WNV vaccination with their veterinarian.
- The California Department of Food and Agriculture (CDFA) and DHS veterinarians are available to talk with horse owners or private practitioners about equine WNV surveillance and prevention. Free testing for clinically suspected cases of equine arboviral encephalitis is available through a joint effort by California Animal Health and Food Safety (CAHFS) Laboratory, CDFA, UC Davis Arbovirus Research Unit, and DHS.
- WNV infection is known to causes illness in wide variety of animals, but has been rarely diagnosed in domestic pets such as dogs and cats. Veterinarians with LACVPH or DHS are available to discuss unusual illnesses among dogs, cats or other domestic animals with private practitioners.
- For more information on veterinary surveillance please contact LACVPH at 323-730-3723 or CA DHS, Veterinary Public Health Section at 916-327-0332.

IV. Dead Bird Surveillance

- Mosquitoes transmit the WNV readily to birds. Wild birds can develop prolonged high levels of viremia and serve as amplifying hosts.
- Dead bird surveillance has noted mortality in more than 130 species of native and captive birds in the United State and Canada.
- High mortality has been especially noted among American crows and other Northern American corvids (ravens, jays, and other crows).
- Dead bird surveillance and subsequent testing for WNV is an important indicator of local WNV activity.
- Dead birds are reported by the public and local health officials to CA DHS as well as Los Angeles County Veterinary Public Health Section. Arrangements for testing are made if the bird has died recently (24-48 hours) and belongs to the corvid family (crows, ravens, magpies, jays) or is a raptor (hawk, owl).
- Birds are currently tested for West Nile virus at the UC Davis Arbovirus Research Unit (DARU). Soon bird testing will also be available through the Los Angeles County Public Health Laboratory, in conjunction with LACVPH.
- LACVPH or DHS arranges pick-up of birds by local agencies.
- To report a dead bird, call 1-877-747-2243.

Dead bird reporting and submission instructions in LAC.

Calls from the public about a dead crow, raven, magpie, jay or hawk should be referred to the Los Angeles County Veterinary Public Health (LACVPH) hotline at 877-747-2243. An alternate number is that of the California Department of Health Services, 877-968-2473. LACVPH or DHS will assess the suitability of the dead bird for testing. The West Nile Virus (WNV) Hotline is monitored 8 am-5 pm Monday through Friday.

Currently, LACVPH staff will take dead birds to the state veterinary laboratory in San Bernardino for shipping to the Davis Arbovirus Research Unit (DARU). Mosquito abatement districts may also ship specimens directly to DARU. DARU will test the bird's tissues for WNV. Submitters will only be contacted if the results are positive. Shipping and testing expenses will be paid by DHS. Any dead birds sent without prior notification will not be tested. LACVPH operates a mobile laboratory so that birds may be necropsies and processed in the field.

To ensure the proper condition of specimens for testing and to comply with regulations for shipping diagnostic specimens, please follow these instructions.

Bird Carcasses

- Only dead birds can be picked up according to our permit.
- Do not touch the carcass with bare hands: wear rubber or latex gloves when picking up and handling it. If gloves are not available use a plastic bag turned inside out to pick up the dead bird.

- Only agencies listed under the permit issued to LACVPH from the California Department of Fish and Game and U.S. Fish and Wildlife Service are authorized to pick up dead birds. The agencies covered include local mosquito abatement districts, some animal control departments, and other designated agencies.
- Collect freshly dead birds (dead <24 hours). If maggots are present or the body is stiff, the carcass is unacceptable. Viruses usually die 48 hours after the bird dies. Decomposed or scavenged carcasses cannot be tested.
- If upon pick-up the carcass is found to be unacceptable (wrong species or decomposed), please collect the bird and dispose of it by placing it inside a double bag (tie or zip lock) and place it in a secure garbage can or dumpster. California Department of Fish and Game and the U.S. Fish and Wildlife Service prefer that you burn or bury the carcass, but disposing of it in a dumpster is acceptable. Immediately call LACVPH and notify them that the bird will no longer be tested so that we can remove the bird from the “tested category”.
- Place each bird carcass into a plastic bag and secure it inside a second plastic bag, then zip lock it shut. Double bagging prevents cross contamination and leakage. There should always be two bags separating the bird from documents/labels that accompany it during shipping.
- Place the bird carcass in a refrigerator or in a cool place until picked up by LACVPH.

If shipping the bird directly to DARU following approval from DHS:

- Pack the bird carcass with blue ice packs (do not use dry ice unless specifically requested by DHS).
- Enclose the shipping document into a SEPARATE ZIP-LOCK BAG. Information includes a return-address label, so your box can be returned, and a copy of the DHS form (with the dead bird number) that was faxed to you by DHS after the dead bird was reported. DARU prefers you put this separate zip-lock bag inside the outer bag containing the dead bird.
- Ship bird carcass in a hard-sided plastic cooler or a Styrofoam cooler place in a cardboard box. Unprotected Styrofoam containers may break into pieces during shipment. Notify DHS to arrange for a carrier pick-up to ship Monday through Friday. This guarantees arrival at DARU before the weekend. If the carcass is fresh and needs to be shipped on Friday, call 1-877-747-2243 to make special arrangements or to obtain instruction on storage until shipment on Monday.
- Label the outside of the package with the words “Diagnostic Specimens ATTN: WNV” above the designated DARU address.

IV. Sentinel Chicken Surveillance

- 207 sentinel chicken flocks are maintained by over 50 local mosquito and vector control agencies throughout California. These chickens are bled biweekly to be tested for arboviruses at VRDL.
- Sentinel chickens can be infected by mosquitoes carrying WNV and other arboviral diseases including SLE and WEE.
- Sentinel chickens become infected without clinical illness.
- Sentinel chicken surveillance has proved useful for detecting WNV in Florida and other states.
- Sera that test positive for St. Louis encephalitis (SLE) are tested for West Nile virus.
- A biweekly report of sentinel chicken serological results is published by the CA DHS, *CA Arbovirus Surveillance Bulletin*, available at <http://westnile.ca.gov/publications>.
- For questions about sentinel chicken surveillance within the state of California, contact (510) 540-2712 or arbovirus@dhs.ca.gov.
- All 5 local vector control districts in Los Angeles County maintain sentinel chicken flocks at various geographic locations (see attached table).

V. Mosquito Surveillance

- Mosquitoes are collected by local mosquito and vector control agencies in many counties for speciation and virus testing.
- *Culex tarsalis*, *Culex pipiens*, *Culex quinquefasciatus* and *Culex stigmatosoma* are known to be suitable vectors of WNV in California.
- Approximately 100 mosquito pools (50 mosquitoes/pool) are tested per week for arboviruses, including SLE, WEE, and WNV.
- Testing is performed at the UC Davis Arbovirus Research Unit.
- The CA DHS reports biweekly mosquito surveillance results in *CA Arbovirus Surveillance Bulletin* <http://vector.ucdavis.edu/surveillance/documents/pdf/files/arbosummary.pdf>
- For questions about mosquito surveillance throughout the state of California, please contact (510) 540-2712.
- All 5 local vector control districts in Los Angeles County conduct mosquito surveillance for WNV (see attached table).

VI. Website and contact information on WNV

Centers for Disease Control and Prevention:
<http://www.cdc.gov/ncidod/dvbid/westnile/index.htm>

California Department of Health Services:
510-540-2712
<http://www.westnile.ca.gov/>.

Acute Communicable Disease Control Program, Los Angeles County Public Health:
213-240-7941
<http://www.lapublichealth.org/acd/>

Vector Management Environmental Health, Los Angeles County Public Health:
626-430-5200
<http://www.lapublichealth.org/eh/>

Mosquito and Vector Control District Websites:

Greater Los Angeles County Vector Control District:
562-944-9656
<http://glacvcd.org/>

West Los Angeles Vector Control District:
310-915-7370
<http://www.lawestvector.org/>

San Gabriel Valley Mosquito and Vector Control District:
626-814-9466
<http://www.sgvmosquito.org/>

Antelope Valley Mosquito and Vector Control District:
661-942-2917
<http://www.avmosquito.org/>

Compton Creek Mosquito Abatement District:
310-639-7375

Long Beach Department of Health and Human Services Vector Control Program
http://www.ci.long-beach.ca.us/health/vector_home.html

Orange County Vector Control District:
<http://www.ocvcd.org/>

Mosquito and Vector Control Association of California:
<http://mvmcac.org/>